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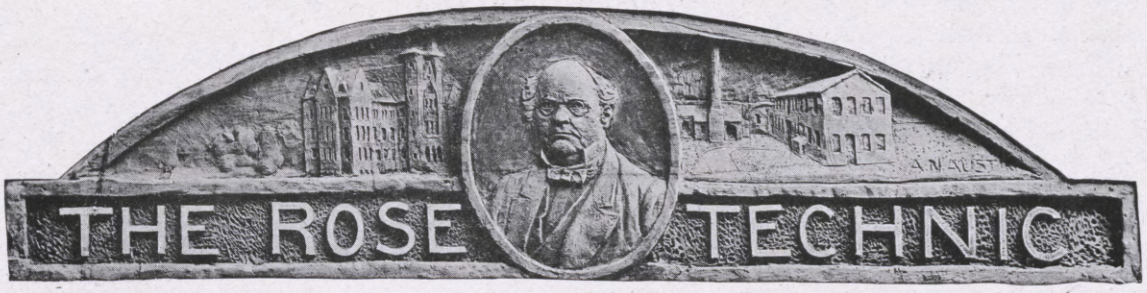
Rose Technic Staff
Rose-Hulman Institute of Technology



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THE TECHNIC

TERMS.

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READERS of the TECHNIC upon perusal of this month's number will doubtless be somewhat surprised when they reach the Alumni section and see the amount of news that has come to us from the Cincinnati District Tech Club. As a matter of fact Alumni news for the month consists practically of only Cincinnati Club news. This club was only organized last May, but at the present time, judging from the echoes that reach us from time to time, it is already the livest club of the ten.

At their last meeting several points concerning the TECHNIC were brought up for discussion. Now, we of the TECHNIC have, from time to time, made requests of the Alumni to lend us some of their more ripened wisdom and to be free with advice and criticism should they think either necessary, but confidentially we didn't think we were running great risks in making such statements, for experience has shown that the average Rose graduate is a pretty busy man and not very apt to keep an exceptionally close watch on us. However, here we find men who want to take us at our word, and after all it is glad indeed we are to find them.

The Cincinnati Club offers two suggestions on methods of creating a greater interest in the TECHNIC on the part of the Alumni. An extract from a letter recently received by the TECHNIC from this club reads as follows:

"The Rose Tech Club of Cincinnati regrets very much to hear of the small number of subscribers that the Rose Technic has this year, and we will make every effort to increase and support the Technic. However, if the Rose Technic will receive a few criticisms and suggestions and accept them in the friendly spirit in which they are given, then we wish to offer the following suggestions.

First:—Request each Rose Tech Club to select one man in their midst as an associate Alumni Editor, and this associate editor to gather news in his district and send it to the Rose Technic every month and the Rose Technic to set aside space with the heading of each Rose Tech Club and print this news, which will surely be of interest to all Rose men.

By printing news which every Rose man will be anxious to know, the list of subscribers will soon increase and the paper will be more apt to be read.

Second: The school makes no effort to keep in contact with men who have attended the Institute for a time. We advise that each Rose Tech Club be requested to supply the names of non-graduates in their district and have these names placed on the mailing list of the Technic for the soliciting of subscriptions, also to be used by the Institute for the mailing of publications of the Institute."

We consider both suggestions good ones which, if followed out, are sure to bring good results. If the first is carried out, we should be able to make the book of much greater interest to the Alumni than it has been heretofore; for we have long realized that our Alumni news is far from complete. We have regretted that the gathering of Alumni news had to be accomplished in a more or less haphazard manner. For our Alumni notes we are almost entirely dependent on what can be gathered from the Institute mail. We have always desired to make the Alumni section a little more than it is, but for this we are entirely dependent upon the Alumni themselves, and it is a well known fact that the chronic complaint of Alumni Editors has been that it is often only after the application of gas and forceps that material for this section can be extracted.

It is only fair to state, though, that the Alumni have been very generous in supplying us with Alumni articles this year, and quite a number have shown their willingness to go to no end of inconvenience in order to help us. On the other hand the Tech clubs have, as a rule, rather gone back on us, and in some cases even the use of the above mentioned methods failed to elicit a response.

We will be only too glad to reserve a certain space in each issue of the TECHNIC if it is in any way possible to get material with which to fill the space. We believe such an arrangement would improve the Alumni section greatly, and hope you Alumni who read this will believe the same, and believe it strong enough to see that *your* club does its part in getting out the monthly bulletin. We have to put it right up to you. If you are willing to help we can easily make the Alumni section of real interest to every old Rose man, but if you are not willing, the TECHNIC staff can do no more than throw up the sponge and quit.

We wish to acknowledge the second suggestion, and for the benefit of the Cincinnati men desire it to be known that action will be taken at once in regard to securing the names and addresses of non-graduates and soliciting their subscriptions.

AT the time of this writing we are just emerging from another rushing season, and if opinions are not already formed, they are rapidly crystallizing. Looking at matters from as nearly an unbiased standpoint as possible, it seems as if the system now in use will be difficult to improve upon. The rushing season, while it lasted, was most intense, in fact so intense that, as results go, the suspension of all school work would not have resulted in any actual loss. It was short, however, and proved most conclusively the value of a short rushing season. Coming at the particular time of year that it does, a long rushing season is unnecessary, and it hardly seems possible that any objections will be brought out along this line. The members of the faculty state that the school work of the student body as a whole has been greatly improved during the past semester. This is attributed, and no doubt correctly, to the change in the system of rushing.

The "death rate" of the Freshman class was not decreased in any marked extent, yet it is impossible to draw conclusions from this, as too many other factors enter into consideration. However, taking account of the failures due to simple inability, and only considering those men whose failure might have been attributed to the hardships of a long rushing season, a comparison of last year's Freshman class and the present shows a decided decrease in failures.

The advantages of the present system may be summed up under five heads.

First—The fraternities benefit by being able to become better acquainted with the men whom they are rushing, and are less liable to make mistakes in choosing men.

Second—The Freshmen benefit in that each man has a chance to form a calm, sober decision, and is not liable to act hysterically on the spur of the moment and later regret his hasty action. The method of inviting Freshmen into the fraternity, while rather a departure from old methods and rather a blow to the romantic side of fraternity life is, after all, the best for all concerned. Other colleges who are facing problems similar to those we faced will do well to investigate.

Third—The fraternities are not put to heavy and needless expense. Money previously spent for rushing may now be used for much better purposes and to the advantage of, not only the upper classmen, but the entering Freshmen as well.

Fourth—The standard of school work is raised.

Fifth—There has always prevailed at Rose an opinion that there are too many fraternities in the school. The present system is more liable to result in the survival of the truly fittest, than the old.

ST. PATRICK'S Day is less than a month off and apparently very little has been accomplished in the way of preparation. The committee has very probably determined on a course of action, yet with the time drawing so near it seems as if it might behoove them to move with celerity and despatch if they are to make the coming celebration the success that it should be.

We were fortunate in getting for publication in this issue a short article from Missouri School of Mines, descriptive of their St. Patrick celebration. With the author of that article we are loud in saying, "Let the St. Patrick's Day Celebration at Rose be a big one!!"

We should by all means have a celebration worthy of remembrance. Last year's celebration was not the success it might have been had there been sufficient time to properly prepare for the occasion. There has been an entire year in which to prepare for the coming celebration, and it should be correspondingly better.

The committee has a big job ahead and it is to be hoped that procrastination will not be responsible for a disappointment in the celebration that every student in school is looking forward to.

WE have been favored this month by an article from W. A. Phillis of the National Tube Co. Mr. Phillis will be remembered as having treated us to an interesting lecture and several reels of most instructive pictures at a general assembly a few months back. The subject of his article is "The Manufacture of Modern Wrought Pipe," and in it he touches upon many of the points brought out in his lecture. Mr. Phillis has our thanks for the article and for the use of the electrotypes.

IN this month's Alumni section we print a problem in grade reduction which was worked out by W. S. Hanley, '05, at the time he was connected with the C. & E. I. Railroad.

Mr. Hanley was requested by the president of the road to determine the amount of capital which might be spent for each foot of grade reduction made in a certain stretch of road in which there was twenty miles of hill of ninety feet to the mile and over which 20,000 tons of traffic passed daily. To quote him, "there was not to reason why, there was but to do or die," and as a result the president received some time later the figures and calculations which are reproduced in this number.

The solution of the problem is interesting, and as it is prepared, may be easily understood by any reader—even though he be a member of the Freshman class.

Mr. Hanley is at present located at Bogalusa, La. He is there engaged as chief engineer for the New Orleans and Great Northern Ry. Company.

The Manufacture of Modern Wrought Pipe

By W. A. PHILLIS*

IN 1815, at the close of the Napoleonic wars, Europe had thousands of fire-arms on hand and its wars were over—for awhile. About this time Murdock discovered artificial gas. There seems to be little connection between these two facts, but gas without some means of conveying it was useless. As necessity is the mother of invention, it did not take long for some one to suggest that pipe lines could be formed by cutting off the barrels of the discarded guns, and joining these into lines for conveying the newly-discovered gas. Thus we see that the wrought pipe industry (which today represents an annual production of nearly 2,500,000 tons) had its beginning in rather a peculiar manner. So much for the history of the tubular industry.

It is not considered necessary in this article to outline the manufacture of "NATIONAL" pipe from the ore. Practically all the men at Rose Polytechnic Institute are at least partially familiar with the process of mining the iron ore up in the Lake Superior district; its transportation to the steel mills of Pittsburgh, Gary, or other manufacturing centers; method of smelting the ore into crude iron containing approximately 95% iron and 5% impurities, and then refining this crude iron into Bessemer or Open-Hearth steel having but ½ of one per cent impurities. The steel is then cast into large ingots weighing from one to five tons, and these are rolled down into the required shapes and sizes.

In the fabrication of wrought pipe, the ingots are rolled out into long thin sheets—called "skelp"—having a gauge equal to the wall thickness of the finished pipe, a width sufficient to form the circumference of the finished pipe, and a length of twenty to forty feet.

Welded tubes and pipe are made by either the butt-weld or lap-weld process. As a rule pipe 2½ inches and smaller in diameter are butt-welded; the larger sizes are lap-welded.

BUTT-WELD PROCESS.

The skelp used in making butt-weld pipe comes from the rolling mill to the pipe making department with a specified length, width and gauge, according to the size pipe for which it is ordered. The edges are slightly beveled with the face of the skelp so that the surface of the plate which is to become the inside of the pipe is not quite as wide as that which forms the outside; thus when the edges are brought together they meet squarely.

The skelp is then heated uniformly to the welding temperature. These strips of steel (skelp) are seized by their ends with tongs and drawn from the furnaces through bell-shaped dies or "bells." The inside of these bells are so curved that the plate is gradually formed in the shape of a tube, the edges being forced squarely together and welded. (See Fig. 4.) The pipe is then run through sizing and cross rolls to secure the correct outside diameter and finish. After leaving the cross rolls the pipe passes to an inclined cooling table up which it rolls, thus preventing unequal cooling. When cold, the ends of the pipe are cut off and the pipe is threaded, if desired, after which it is tested.

LAP-WELD PROCESS.

The lap-weld process consists of two operations, bending and welding. The plate, rolled to the necessary width and gauge for the size of pipe intended, is brought to a red heat in a suitable furnace and then passed through a set of rolls which bevel the edges so that when

* Member of Engineers Society of Western Pennsylvania.

overlapped and welded the seam will be neat and smooth. It now passes to the bending machine, where it takes roughly the cylindrical shape of a pipe with the two edges overlapping. In this form it is again heated in another furnace, and when brought to the welding temperature the bent skelp is pushed out of the furnace into the welding rolls. Each of these rolls has a semi-circular groove forming a circular pass, corresponding to the size of

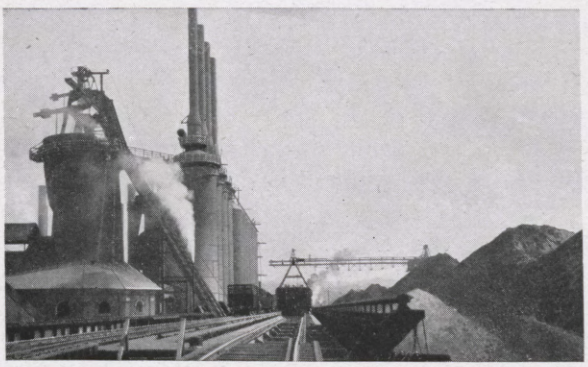


FIG. 1 VIEW OF BLAST FURNACES

pipe being made. A cast iron ball, or mandrel, held in position between the welding rolls by a stout bar, serves to support the inside of the pipe as it is carried through. This ball is shaped like a projectile and the pipe slides over it on being drawn through the rolls. Thus every portion of the lapped edges is subjected to a compression between the ball on the inside and the rolls on the outside, which reduces the lap to the same thickness as the rest of the pipe, and welds the overlapping portions solidly together. (See Fig. 5.)

The pipe then enters similarly shaped rolls called the sizing rolls, which correct any irregularities in shape and give the exact outside diameter required. Any variation in gauge makes a proportional variation in the internal diameter. Finally the tube is passed through the straightening or cross rolls, consisting of two large rolls set with their axes askew. The surface of these rolls are so curved that the tube is in contact with each for the whole length of the roll, and is passed forward and rapidly rotated when the rolls are revolved. The tube is made practically straight by the cross rolls, and is also given a clean finish with a thin, firmly adhering scale.

After this last operation the tube is rolled up an inclined cooling table, so that the metal will cool off slowly and uniformly without internal strain. When cool enough the rough ends are removed by cold saws or a cutting-off machine after which the tube is ready for inspection and testing. In the cases of threaded pipe the ends are threaded before testing.

DOUBLE EXTRA STRONG PIPE.

In the case of some sizes of double extra strong pipe (3-inch to 8-inch) made by the lap-weld process, two pipes are first made to such sizes as will telescope one within the other, the respective welds being placed opposite each other; these are then returned to the furnace, brought to the proper welding heat and given a pass through the welding rolls. While a pipe made in this way is, in respect to its resistance to internal pressure, as strong or stronger than when made from one piece of skelp, it is not necessarily welded at all points

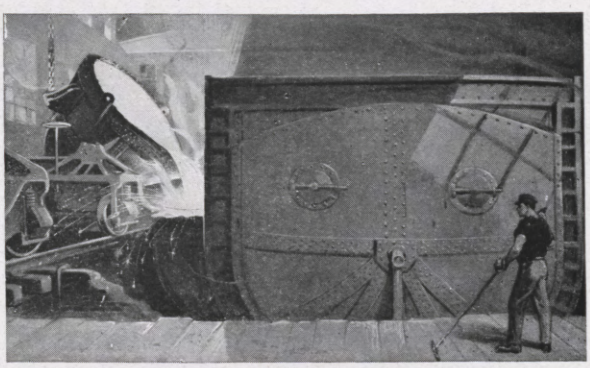


FIG. 2 CHARGING 300-TON HOT IRON MIXER

between the two tubular surfaces; however, each piece is first thoroughly welded at the seam before telescoping.

A WORD ABOUT MATERIALS USED.

Prior to 1888, wrought iron was the only material used in the manufacture of "wrought" pipe. Owing to the fact that wrought iron possessed a number of disadvantages to the

pipe manufacturer and the pipe consumer, considerable research was carried on with the idea of developing a satisfactory grade of steel to be used instead of wrought Iron. This was successfully accomplished in 1888, when the

FIG. 3 INTERIOR OF PIPE MILL

first steel pipe was welded at Wheeling, West Virginia, plant of National Tube Company. From the beginning, steel proved itself to be most satisfactory material for pipe. Being made in much larger units (tons instead of pounds) than wrought iron it is easily possible to secure unvarying uniformity in chemical and physical properties of steel. As uniformity of material is an important factor in the weldability of a material, it is vitally important that uniform material be used in manufacturing pipe—as the strength of the weld largely determines (for many uses) the value of the pipe itself. In the matter of strength, steel has a large advantage of wrought iron, as is shown by the following comparison of the physical properties of the two materials:

	Pipe Steel	Wrought Iron
Ultimate Tensile Strength	58,000	46,000
Elastic Limit	36,000	28,000
Elongation in eight inches	22%	12%
Reduction in Area	55%	25%

RELATIVE DURABILITY.

In fact, the only point that has been seriously debated regarding the advantage of steel pipe over wrought iron pipe has been "durability,"—and this question has been practically decided in favor of modern steel pipe although it is true that a number of people maintain there is no difference in the corrosion of wrought iron and steel pipe. There is always a certain amount of prejudice against improvements and new things; and this no doubt accounts for whatever prejudice there has been against steel pipe. Figures do not lie, we are told, and it is important therefore to study the following figures to see which material, wrought iron or steel, is meeting with public approval:

**Skelp Production (1905 compared with 1913).

	Pipe Steel	Wrought Iron
1905 ..... Tons	983,198	452,797
1913 ..... Tons	2,189,218	312,746

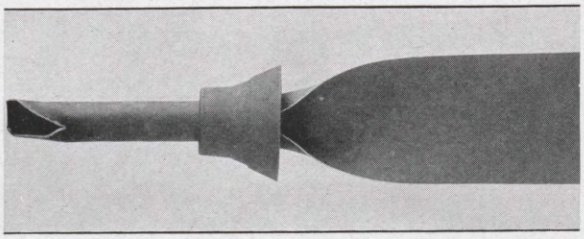


FIG. 4 BUTT-WELD "COBBLE"—SHOWING BUTT-WELD PRINCIPLE

From these figures we obtain an accurate comparison of the consumers' opinion of the relative efficiency and value obtained from wrought iron and steel pipe. Need any further proof be given of the success of steel pipe than this increase in its use from less than a million tons in 1905 to more than two million of tons in 1913; and of the decadence of wrought iron during the same period,—the consumption of wrought iron having decreased from about 450,000 to approximately 300,000 tons. Isn't that real proof?

Working in the research department of the largest pipe manufacturer in the world, the writer has had every opportunity to investi-

** These figures taken from Special Statistical Bulletin No. 8 of the Bureau of Statistics, American Iron and Steel Institute.

gate many cases of pipe failure. In practically every instance a thorough examination revealed the fact that steel pipe had given equal or better service than wrought iron pipe.

CUTTING AND THREADING PIPE.

Unfortunately, the average layman is prone to use die stocks and cutting tools which are improperly designed or maintained. A rather humorous incident is found in the case of an engineer with whom the writer talked. He

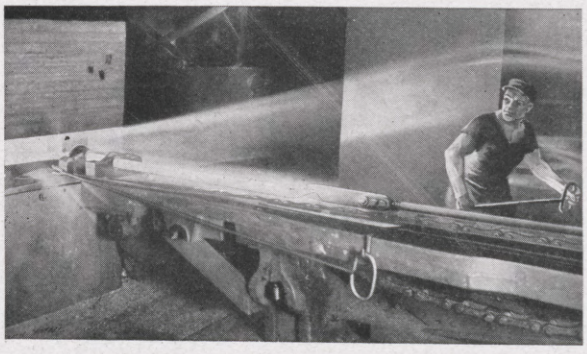
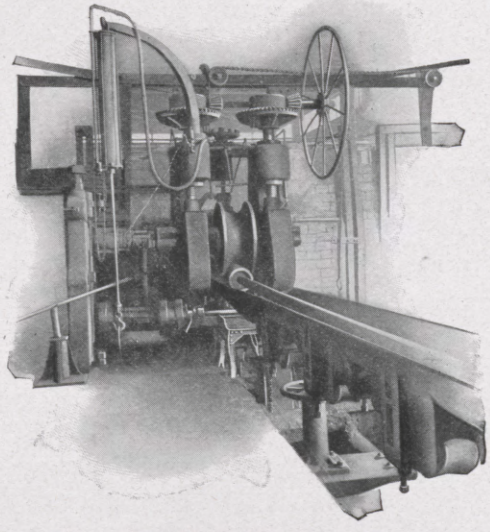


FIG. 5 DRAWING BUTT-WELD PIPE

was having trouble threading pipe and condemned the pipe. An investigation of the dies he was using immediately showed them to be in deplorable and unsatisfactory condition. When asked about the condition of the dies he replied that "the trouble could not be due to the dies as I have been using those dies for fourteen years and have never had any trouble with them." Just imagine, will you, using one set of dies, without resharpening, for fourteen years—and then because he had trouble threading pipe with them blamed the pipe. While this case is rather worse than the average, still it is a fact that the pipe consumer is prone to neglect his tools—die stocks and cutting tools. The subject of threading is covered very thoroughly in a bulletin issued by the National Tube Company, and any one interested can obtain a copy of this booklet free.

The subject of pipe cutting is quite as important as pipe threading, and the success of the threading is to some extent dependent upon the manner in which the pipe is cut. An ordinary wheel cutter leaves a rough, ragged burr on the outside of the pipe and if this is not removed before the pipe is threaded your dies are apt to split the pipe at the weld. The dies become quickly dulled, too, when this burr is not removed before threading. The inside burr left by the wheel cutters should be reamed out on account of the tendency of this rough burr to choke circulation, and form a lodging place for whatever solid matter is in the water or liquid being transported. Just as the past few years has seen a vast improvement in the design of pipe threading dies, it is likely that the coming few years will witness great improvements in pipe cutting tools. The ideal cutting tool is one which gives a square end cut, immediately, without any filing or reaming to remove burrs. There are several such tools now on the market and it is probable that within five years all manufacturers will be putting out square end cutters.



LAP-WELDING ROLLS (MANDREL IN POSITION)

When you have threading or cutting difficulties—remember this: Don't condemn the pipe until you have investigated the condition and design of your threading and cutting tools.

St. Patrick's Day at Rolla

BY A ROLLA-ITE

JUST why the engineers have come to recognize St. Patrick as their patron saint is a question which no man can answer. Herding snakes seems to be more the occupation of a zoologist than an engineer. Yet as tradition has it that old St. Pat was the original little dam constructor and had it on all the other brothers when it came to doping out things according to the calculus, necessarily, since tradition is the one thing in life that is really sacred (to a college student), we revere the memory of the venerable gentleman, sing various and sundry verses of a song bearing directly on the fact that he was an engineer, and set aside one day each year in order to celebrate in a fitting manner his various feats as an engineer which we don't know about, but take as a matter of course.

The celebration of St. Pat's Day by engineering students began at Missouri University, but when it began and why it began are facts not very well known. As an engineer always welcomes a celebration of any sort, small matter what the cause or reason is, those facts are of minor importance, after all.

In 1908 St. Pat's Day was first celebrated at Missouri School of Mines. A committee had been sent to Columbia, Missouri, to see how the Missouri University engineers celebrated the day, but even while this delegation was at Columbia, the students at Rolla decided not to wait until the following year for a celebration, and on the spur of the moment, assembled a parade and held their first Seventeenth of March Celebration.

Since that time a celebration has been held each year, and the Miners are now looking forward to a union with other colleges in order that all engineers may join the annual celebration. At present we are corresponding with the St. Patrick Committee of Missouri University in regard to such a movement, and as it is understood that Rose Polytechnic has recently inaugurated a celebration on this day, it is certain that should she care to ally herself with these two schools she would receive a hearty welcome into this organization.

In regard to the kind of celebration we hold, perhaps a brief description will prove interesting. The Junior class takes charge of the celebration, and along about December begins to hold meetings and collect class dues. They plan the day's program. Financial aid is obtained from the town merchants as well as the students. The students are assessed about seventy-five cents each.

On "St. Patrick's Day in the morning," there is a grand St. Pat's parade through the town. The Saint arrives (in costume) on a handcar, and is met at the station by his followers. The parade consists of the bands; the St. Patrick's float; the Seniors, who are garbed in green caps and gowns; and numerous floats based on school and town happenings. These floats are prepared by individuals, at their own expense, and by the various classes, clubs, fraternities, and organizations.

After the parade, the Knighting of the Seniors takes place on the campus. A large space is roped off in front of one of the school buildings, and upon his arrival the Saint gives his order, "Kow-tow," when his followers fall forward on their knees and bow their heads in the dust until he gives the order, "Arise my Sons." He then delivers a pointed address which touches on many localisms. After this is completed, the Seniors are singly knighted, and with the accompanying ceremonies and the kissing of the blarney stone, they are received into the "Ancient Order of St. Patrick." This ceremony concludes the morning program.

The early afternoon is devoted to the carnival. At the carnival are held fake shows, boxing matches, and various contests. Later in the afternoon some kind of show, written and staged by students, is presented at the auditorium.

The evening festivities consist of a picture show which is followed up by the Masquerade Ball. This dance is by far the best affair of the year. St. Patrick visits the hall during the evening and takes his place on the throne. Before he makes his farewell speech he crowns the queen, and then later in the evening during on of the following dances he disappears into the crowd and slips off to the Emerald Isle.

All of the attractions during the day are absolutely free for everyone, and one would be surprised at the numbers which attend. Taken as a whole, the day is very impressive with its various ceremonies which are conducted with no small amount of pomp and display, and there can be no better way to instill and perpetuate a strong school spirit. The strong point of such a celebration is that it is something in which every man in school can take a part, and when it is a thing of the past it is sure to be recalled to the memory with many pleasant thoughts. Whatever the nature of the celebration at Rose, let it be a big one!

Should Rose care to adopt a form of celebration similar to that in use at the School of Mines, it might perhaps be well to send a committee down to our celebration this year. Rolla will be glad to assist in making the Rose celebration as worth while as her own.

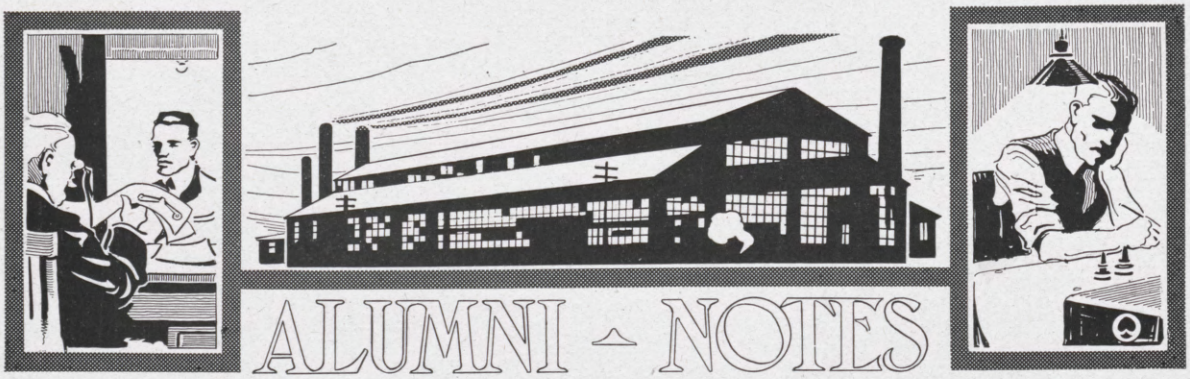
James J. Dowd, '16.
Missouri School of Mines.

Second Annual Good Roads Week

A second annual good roads week will be held at the College of Civil Engineering, Cornell University, from February 21 to February 26, inclusive. This meeting is in co-operation with the New York state Highway Department and the Federal Office of Public Roads. It is announced that the program will consist of a series of illustrated lectures delivered by experts on various subjects connected with highway engineering. There will be, in addition, demonstrations and round-table discussions to include subjects of bridge design, reinforced concrete, the selection and use of surveying instruments, and other kindred topics, such as the identification of road materials, demonstration tests of such materials, and of the strength of beams and columns. In the strength tests, the laboratories of the College of Civil Engineering with their testing apparatus will be used.

Last year's meeting, the first of its kind in New York state, resulted in bringing together more than three hundred highway engineers and contractors, county and town road superintendents and other interested in the subject of good roads. This year there are indications of a much larger attendance, and it is likely that good roads week will become an annual feature. Invitations have been sent to road experts of this state and other states, and among the authorities who will be present will be a number from the federal departments in Washington, and from New Jersey and Pennsylvania as well as New York.

It is announced that the whole course of instruction will be free, and that everyone interested is cordially invited to attend. Detailed information can be had by writing to the Highway Department, College of Civil Engineering, Cornell University, Ithaca, New York.



Grade Reduction Problem

By W. S. HANLEY, '05

Question:

Given a road between A and B twenty miles of hill of ninety feet to the mile moving twenty thousand tons of traffic up the hill daily, what is the curve of capital expenditure that they can afford to spend per foot of grade reduction with coal at four dollars per ton on the tender?

Answer:

The amount that can be spent per foot of grade reduction has other determining factors other than coal consumed, the most important of which is the saving resulting from the reduction of train mileage.

This in turn depends upon the length of engine district, the type of engine used and the wages paid employes.

For this particularly case we will assume an engine district of 120 miles long on which there is 20 miles of grade 90 feet to the mile to be overcome, a simple consolidated type engine of 170 tons with a tractive force equal to 39,364 pounds and wages of trainmen at the same scale as paid in this section.

With these assumptions it is found that with the existing grade, the yearly train mileage amounts to 1,122,500 train miles. This result is reached by the following methods:—

The train resistance is taken as five pounds per ton on the level. The grade resistance 34 pounds per ton or 20 times the per cent of gradient, which in this case is 20x1.705 equals 34.1.

The total resistance equals 34.1 plus 5 or 39.1. The speed to be maintained on the gradient is taken as ten miles per hour.

The drawbar pull exerted by the locomotive at a speed of ten miles per hour is 30,508 lbs.

The drawbar pull divided by the total resistance equals 780.3, the tonnage for one train. This into the daily tonnage, 20,000 tons equals 25.63, the number of trains moved daily.

The engine district being 120 miles, the yearly train mileage is equal to 25.63 trains per day x 365 days x 120 miles equals 1,122,500 train miles from A to B.

The yearly train mileage for every change in gradient is figured in a similar manner.

The fuel consumed is estimated in the following manner:—

The pounds of coal consumed per indicated Horse Power Hour is equal to the pounds of water per 1 H. P. Hour divided by the pounds of water per pound of coal.

From data determined from actual tests, it takes 34.9 pounds of water per Horse Power

Hour and 5.1 pounds of water per one pound of coal, therefore, 34.9 divided by 5.1 equals 6.84 or pounds of coal per indicated Horse Power Hour.

Taking the efficiency equal to 75%, the pounds coal per available Horse Power Hour is equal to 9.12 pounds.

The available Horse Power is equal to the tractive force times the velocity in miles per hour divided by 375.

The available Horse Power at ten miles per hour on the controlling gradient is equal to 30,508x10 divided by 375 or 813.4.

The coal consumed ascending the 20 mile grade is equal to the available Horse Power times the pound of coal per available Horse Power Hour into the time consumed and is equal to 813.4x9.12x2 divided by 2000 equals 7.42 tons.

Assuming a maximum speed of 35 miles per hour for freight trains, by the same method it is found that the tons of coal consumed by one engine over the remainder of the district is equal to 5.69 tons, and total tons coal consumed by one engine over the entire district is equal to 13.11 tons.

In the same manner the tons of coal for lower gradients may be determined.

The item effected by a reduction in train mileage are:

(1) Wages of train and engine crews.
(2) Repairs to engines and terminal care.
(3) Supplies and Lubrication.
(4) Fuel.

The first three items are constant for any train on any grade. The fourth item varies with the per cent of gradient.

The cost of each item per train mile, fuel being figured for a grade of 90 feet per mile, is as follows:

(1)	(a) wages of Engine Crew,	.075,	Round Trip	.15
	(b) wages of Train Crew,	.086,	" "	.172
(2)	Repairs and Terminal care of engines,	.09,	" "	.18
(3)	Supplies and Lubrication	.02,	" "	.04
(4)	Fuel at $4 00 per ton on tender A to B only			.437
	Total cost per train mile, grade 90 ft. per mile,			.979

The number of train miles for one year on a grade of 90 ft. per mile being 1,122,500 train miles, the cost for one year on the grade will be .979 times 1,122,500 or $1,099,000.00.

The results obtained for the lower grades have been worked out by the same process, tabulated on the accompanying print and shows the reduction in cost of operation capitalized at 5% for each foot of grade reduction.

The reduction in cost of operation resulting from fuel alone is approximately $2,600.00 per foot of grade reduction.

The accompanying statement shows the reduction in the cost of operation of the different grades and this capitalized at 5% gives the amount that is available to be expended for grade reduction.

The question then to be decided is whether or not this amount of money will make the grade reductions and other necessary improvements that always arise out of such changes in grade.

In estimating the cost of grade reduction it is necessary to take into consideration a great many items, which should be carefully analyzed, such as:

(1) Possible extension of passing tracks due to increased length of trains.

(2) Bridges may be made necessary at highway and railway crossings in place of grade crossings or vice versa.

(3) Existing interlocking systems will probably have to be changed or taken out and new systems installed in some places where there was none required before the change.

(4) Water and fuel stations may have to be moved and relocated at more convenient points.

(5) Existing bridges may have to be raised, lowered or rebuilt.

(6) Depots, freight houses and other buildings may have to be moved or changed.

(7) Some station grounds may have to be reconstructed or abandoned causing a reduction or total loss of the business received at those points.

TABLE SHOWING REDUCTION IN COST OF OPERATION FOR DIFFERENT GRADES.
Continuous Trains in Direction of Ascending Grades. (No Pusher Engines Used.)

Col.1	Col. 2	Col 3.	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12	Col. 13	Col. 14
Grade		Resistance per Ton on Grade	Train Mileage				H. P. of Engine on Level	Tons of Coal on Level 1 Eng.	Cost per Tr. Mi.		Operating Expenses		
Ft. per Mile	Per Cent		Tons per Train	No. of Trains Daily	Train Miles One Year	Cars per Train			Coal Alone	All Exp. Considered	Cost One Year	Reduction of Cost—1 Yr. Amount	Reduction of Cost—1 Yr. Capitalized 5%
		LBS.							CTS.	CTS.	$	$	$
90	1.705	39.10	780.3	25.63	1,122,500	17.3	436.97	5.69	43.7	97.9	1,099,000	.....	.....
89	1.686	38.72	787.9	25.39	1,112,000	17.5	441.22	5.75	43.9	98.1	1,091,000	8,000	160,000
88	1.667	38.34	795.7	25.14	1,101,000	17.7	445.59	5.81	44.1	98.3	1,082,500	16,500	330,000
87	1.648	37.96	803.7	24.88	1,089,500	17.9	450.07	5.86	44.3	98.5	1,073,000	26,000	520,000
86	1.629	37.58	811.8	24.64	1,079,000	18.0	454.61	5.92	44.5	98.7	1,065,000	34.000	680,000
85	1.610	37.20	820.1	24.39	1,068,500	18.2	459.26	5.98	44.7	98.9	1,056,500	42,500	850,000
80	1.515	35.30	864.2	23.14	1,013.500	19.2	483.95	6.31	45.8	100.0	1,013,500	85,500	1,710,000
75	1.421	33.42	912.9	21.91	959,500	20.3	511.22	6.66	47.0	101.2	971,000	128,000	2,560,000
70	1.326	31.52	967.9	20.66	905,000	21.5	542.02	7.06	48.3	102.5	927,500	171,500	3,430,000
65	1.231	29.62	1030.0	19 42	850,500	22.9	576.80	7.51	49.8	104.0	884,500	214.500	4,290,000
60	1.136	27.72	1100.6	18.17	796,000	24.5	616 34	8.03	51.5	105.7	841,500	257,500	5,150,000
55	1.042	25.84	1180.7	16.94	742,000	26.2	642.30	8.61	53.4	107.6	798,500	300,500	6,010,000

EXPLANATION OF DERIVATION OF TABLE.

Col. 1 (Given) Existing grade of 90′ per mile to be reduced.

Col. 2=$\frac{\text{Col. 1}\times 100}{5280}$

Col. 3=(Col. 2×20)+5. Vel. (10 mi. per hr.) Resistance=5.

Col. 4=$\frac{30508}{\text{Col. 3.}}$ D. B. P. at 10 mi. per hr.=30,508 lbs.

Col. 5=$\frac{20000}{\text{Col. 4.}}$ Tons of traffic daily=20,000.

Col. 6=Col. 5×120×365. Engine district=120 mi.

Col. 7=$\frac{\text{Col. 4}}{45}$ Capacity=30 tons, Car=15 tons.

Col. 8=$\frac{6\times\text{Col. 4}\times 35}{375}$ Vel. (35 mi. per hr.) Resistance=6.

Col. 9=$\frac{\text{Col. 8}\times 9.12\times 100}{2000\times 35}$ Tons of coal per A. H. P. per hr.=9.12.

Col. 10=$\frac{(\text{Col. 9}+7.42)\times\$4.00}{120}$ { Coal costs $4.00 per ton on tender (given). Coal used on grade=7.42 tons ($\frac{30,508\times 9.12\times 20}{2000\times 375}$=7.42) 20 mile grade.

Col. 11=Col. 10+54.2. Total of other expenses considered=54.2 cts. Tr. mi.

Col 12=Col 6×Col. 11.

Col. 13=No. 1 of Col. 12—other numbers.

Col. 14=$\frac{\text{Col. 13}}{.05}$ Interest of capitalization 5%.

FORMULAE:

H. P.=$\frac{\text{T. F.}\times\text{V.}}{375}$ (=813.5 on the grade).

Lbs. of coal per 1 H. P. hour=$\frac{\text{Lbs. H}_2\text{O per 1 H. P. hr.}}{\text{Lbs. H}_2\text{O per lb. of coal}}$=$\frac{34.9}{5.1}$=6.84.

A. H. P.=75% of 1 H. P. ∴ Lbs. of coal per A. H. P. per hr.=$\frac{3}{4}$×6.84=9.12.

OPERATING EXPENSES CONSIDERED.

1. WAGES. (a) Engine crew . . . . 7.5c per Tr. Mi.
   (b) Train crew . . . . . 8.6c " "
2. ENG. REPRS. AND TERM. CARE . . . 9.0c " "
3. SUPPLIES AND LUBRICATION . . . . 2.0c " "
   Total for round trip . . . . . 54.2c " "

NOTES:—The above items of expense are considered in both directions, but the fuel expense is considered in the direction of up grade only. There are 20 mi. of grade to be reduced (not in one stretch).

MAX SPEED. 35 mi. per hr. on level.
10 " " " grade.

ENGINE USED: 170 T. Cons'n type (Traction Po. 39,364 lbs).

C. & E. I. ROAD ENG. Class 225-234=151.2 Tons.
Tractive Power=38,777 Lbs.

(8) Additional right of way will probably have to be purchased.

(9) It might be advantageous to relocate the line in places where a change in alignment would make conditions more favorable for the new grade line.

(10) The telegraph line will probaly have to be changed in places.

(11) The reconstruction and grading work will interfere with the traffic to a certain extent and this should be limited as much as practicable by offsetting or relocating the new line or by shifting the main tracks.

(12) The drainage of long cuts may be very expensive in some places.

(13) The roadbed will have to be rebal-lasted.

(14) Decreased number of trains means a proportional less liability of accidents.

(15) It may be economy to build a second or third track rather than reduce the grade of the original track.

(16) It should be borne in mind that unless the total ascent is decreased the amount of time consumed by a train going over the district will be increased.

In making a careful estimate of the wor' to be done, it will probably be found that the changes made in order to secure a certain grade will result in new structures or changes, the additional cost for maintenance of which will have to be considered and the amount capitalized and added in as a part of the amount available for improvements.

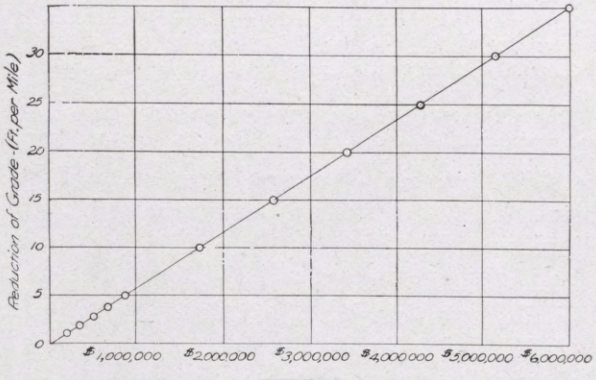
All grade changes are made with a view of facilitating the movement of trains so that heavy trains may be moved over the road at a minimum cost, and unless the railroad company's operating officer can convince the company that there is a profit to be secured by making these expenditures, it will be impossible for him to get the improvements.

If the traffic over the line can be increased, there will be a profit from the reduction in grade, but unless we are assured that the traffic will be increased, a fair profit should be deducted from the amount available for improvements and the balance will represent the actual amount that can be spent for improvements that may be necessary to secure the required results.

TABLE SHOWING REDUCTION IN COST OF OPERATION FOR DIFFERENT GRADES

GRADE		TRAIN MILEAGE			OPERATING EXPENSES			
Ft. Per Mile	Per Cent	No. of Trains Daily	Tons Per Train	Train Miles One Year	Cost Per Train Mi.	Cost One Year	Reduction of Cost—One Yr. Amount	Capt. at 5 pct.
90	1,705	25.63	780.3	1,122.500	$.979	1,099,000		
89	1,686	25.39	787.9	1,112,000	.981	1,091,000	$ 8,000	$ 160,000
88	1,667	25.14	795.7	1,101,000	.983	1,082,500	16,500	330,000
87	1,648	24.88	803.7	1,089,500	.985	1,073,000	26,000	520,000
86	1,629	24.64	811.8	1,079,000	.987	1,065,000	34,000	680,000
85	1,610	24.39	820.1	1,068,500	.989	1,056,500	42,500	850,000
80	1,515	23.14	864.2	1,013,500	1,000	1,013,500	85,500	1,710,000
75	1,421	21.91	912.9	959,500	1,012	971,000	128,000	2,560,000
70	1,326	20.66	967.9	905,000	1,025	927,500	171,500	3,430,000
65	1,231	19.42	1030.0	850,500	1,040	884,500	214,500	4.290,000
60	1,136	18.17	1100.6	796,000	1,057	841,500	257,500	5,150,000
55	1,042	16.94	1180.7	742,000	1,076	798,500	300,500	6.010,000

CURVE SHOWING REDUCTION IN COST OF OPERATION CAPITALIZED AT 5 PER CENT INTEREST



ALUMNI NOTES

A short time ago the marriage of Miss Elyne Rook, daughter of Mrs. Kate Rook, 735 Maple avenue, to Harvey Failing, son of Walter Failing, of the Harvey Furniture Co., was announced. The marriage took place at Bennington, Va., and they immediately left for Schenectady, N. Y., where they will make their home. Mr. Failing is employed with the General Electric Co.

E. F. Scheffel, '13, who has been in Denver, Colo., since his graduation, has accepted a position in Wilmington, Del.

The Indianapolis Tech Club held a meeting on Monday evening, January the 27th.

A letter has been received by the basket-ball Manager from the Indianapolis Tech Club stating that they had made preparations to entertain the team on the night of the Butler game.

On March 3rd, the Chicago Tech Club held a meeting.

Cincinnati District Rose Tech Club Smoker.

The Cincinnati District Rose Tech Club held a smoker on Saturday evening, January 29th, at the Business Men's Club, Cincinnati, Ohio. Those attending were:

Fred C. Brachmann, '98.
J. D. Lyon, Ex. '92.
J. B. Hunley, '03.
J. W. Dale, Ex. '94.
Cale Wamsley, '98.
A. A. Piper, '10.
Davis Levi, '13.
Luther S. Rose, '92.

Regrets were received from J. V. Davidson, P. W. Kingler, W. J, Fogarty, W. D. Crebs, W. E. Baker and C. L. Anderson.

The meeting was opened by our Estimable President at the Helm, Fritz Brachmann. After disposing of the usual business of the club, considerable discussion was given concerning the Technic and resolutions were passed for the advancement of the Technic among the Alumni.

To show our interest and enthusiasm subscriptions were received from every member present, who is not already a subscriber for the Technic. We expect to make every member of the Cincinnati District Club a subscriber.

Following this L. S. Rose gave a thrilling talk on "Preparedness" that would rival President Wilson or Kaiser Wilhelm. All members were than called on and Cale Wamsley and J. D. Lyon were tie when it came to relating experiences where Preparedness was necessary. (Rose is still trying to figure out how long the keg lasted).

Cigars, cigarettes, sandwiches, etc., (and mostly etc.), were in evidence throughout the evening.

The meeting broke up at a good hour, and enthusiasm and anticipation for the next meeting to be held in March was displayed. Don't let any member miss the next meeting to be held in March.

cincinnati district notes.

The Cincinnati District Club will hold a meeting in March. J. D. Lyon and A. A. Piper are in charge of the arrangement.

W. E. Baker, '11, has accepted a position as efficiency engineer with the Barney and Smith Car Company, Dayton, Ohio. Other Rose men who have made good with this company are, P. W. Klinger, '96, Superintendent, and W. J. Fogarty, '92, Mechanical Engineer.

Herbert F. Madison, class of 1900, has recently enrolled in the Cincinnati District Rose Tech. Club. Mr. Madison is chief chemist for the Ashland Coal & Mining Company, Ashland, Ky.

Davis Levi, '13, has entered his name in the list of Cincinnati manufacturers, having recently opened up a machine shop and is meeting with great success.

Sol L. Levi, Ex. '03, has recentiy established himself in the wholesale confectionery business, known as the Queen City Confection Company, 643 Main street, Cincinnati, Ohio.

Louis Werk, '96, is now a baseball magnet, having recently been elected a director in the Cincinnati Baseball Club. Let every Rose man root for the Reds, and hope they will win the 1916 pennant.

Cale Wamsley, '98, has been doing valuation work for the Big Four Railroad for the past year, and has his headquarters in Cincinnati, figuring up field work.

The following Non-graduates are listed in the Cincinnati District Rose Tech. Club. We would appreciate hearing from every Rose man who knows of any non-graduates in this district not listed below:

Sol. S. Levi, Ex. '03.
J. D. Lyon, Ex. '92.
J. W. Dale, Ex. '94.
Lester Bachmann, Ex. '10.
Minto Henderson, Ex. '00.
H. D. Gerwig, Ex. '98.
Sam Fechheimer, Ex. '93.
F. L. Townley, Ex. '00.

ROSE LEAVES

THE annual Senior celebration was held on Friday, January 21st. Following a few brief and concise words from our dear President, the first shot was fired about 10:30, and the fusillade continued till 11:00. There were no fatalities, with the exception of a minor accident to the cannon, which rendered its firing device null and void. Mr. Somers, the esteemed electrical, volunteered however, to fire his revolver into the powder chamber of the 3 centimeter, and so the joy continued unconfined and unrefined. The Freshmen bore the attack bravely, even after they had been driven from their citadel in the Math. room, and even "Doc" himself fired a few shots.

At eleven o'clock a general assembly was held, at which R's were awarded to last year's baseball, track and tennis men, and this year's football men. The latter also received gray sweaters, which will be awarded to all R men in the future. Following speeches by "Meff" and "Hath," the meeting adjourned, just in time for lunch.

R's were awarded the following men:

Basketball (1914-15)—Carter, Kingery, Barrett, Brown, Davis and Hegarty. Reserves—Larr, Orr, and Yatsko.

Baseball—Larr, Bake, Hegarty, Brown, Trimble, Kline, Carter, Drake, and Stoltz. Reserves—Yatsko, Finkelstein, O'Brien, McKeever, and Mikels.

Track—Sanford, Binhack, and Stevens. Reserves—Risser and Stuart.

Football—Davis, Floyd, Grafe, Henry, Orr, Buck, Trimble, Goldsmith, Wagner, Yatsko, and Bake. Reserves—Woodling, Crapo, Carter, Summers, and Barnes.

Tennis—Wente.

The Student Council at their last meeting elected Walter S. Risser, '17, to the position of Financial Secretary as the successor of Robert A. Weinhardt, '16. Risser has already assumed the duties of the office, which he will occupy until January, 1917.

W. C. Woodling, '18, was elected assistant football manger at the January meeting of the Athletic Association. Woodling is a worker and should prove a good man for the position to which he was elected. His election was by a unanimous vote.

STUDENT COUNCIL MEETING.

Feb. 4, 1916.

O'Laughlin and Grafe absent.

Vice-President O'Brien presiding, and Carlisle Secretary pro-tem.

Leibing reported that the Books of the Financial Secretary were in good shape.

Report of Mefford sent over. Reports the expenses for the month of January to be $391.00.

Moved by Weinhardt that a committee be appointed to look over the report of Mefford and sign them if alright. Seconded by Tilley. Carlisle, Wyman and Tilley appointed.

The names of Risser, Wente and Whelan were proposed for the position of Financial Secretary for the coming term.

The result of the voting was: Risser 4; Wente 2; Whelan 2.

Motion made by Leibing for adjournment and seconded by Weinhardt. Carried.

C. F. CARLISLE,
Secretary Pro-Tem.

Fraternity Pledges

ALPHA CHI SIGMA.

George Owens.
Emmett L. Miller.
Raymond F. Abbett.

ALPHA TAU OMEGA.

Winton H. Streeter.
John K. Piety.
Richard A. Leathers.
Warren McKeen Hussey.
Richard P. Gillum.
William R. McKeen.
DeWitt Cromwell.
Alexander P. King.

P. I. E. S.

Earl Wessel.
George M. Owens.

SIGMA NU.

Leland S. Kurfess.
Edward M. Ewens.
Robert L. Tilley.
Owen G. Floyd.

THETA XI.

John A. Wagner.
Robin E. Woodruff.
William H. Bruning.
Herman G. Schlaman.
Lester S. Stinson.

V. Q. V.

Adolph E. Reinhard.
Alvin N. Barnes.
Raymond F. Abbett.
J. Walter Hauck.
Emmett L. Miller.

ANNOUNCEMENT

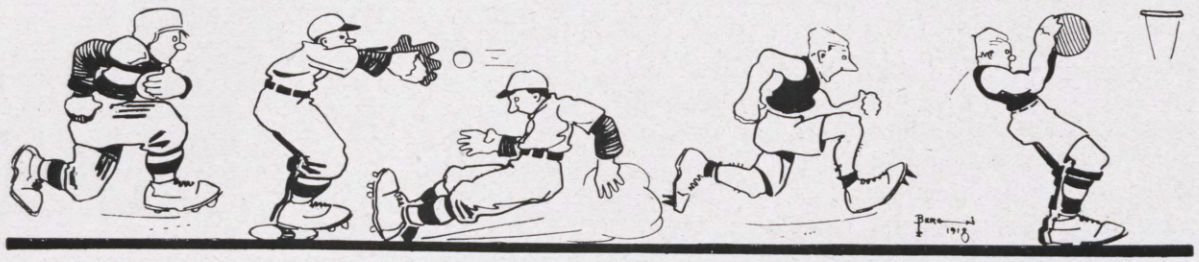
The March issue of the Technic is to be the New School Number.

It will contain in addition to numerous illustrations, an article concerning the new buildings and their arrangement, a discussion of the plans which the Alumni Association is putting forward in their building fund campaign, and other articles which you are sure to find of interest.

Those questions which you have long been asking yourself regarding the new school will be answered.

This number will not only be of interest to you, but to your friends.

Extra copies may be obtained for fifteen cents. Get your orders in early in order that a sufficient number may be printed to supply the demand.



ATHLETICS

ROSE VS. EVANSVILLE Y. M. C. A.

ALTHOUGH four of the men who made the trip were sick with grippe, the Engineers played a fast hard game against the Evansville Y. M. C. A. Athletes, and also against Vincennes "Y" on the following night, but they lost, due to inability to hit the basket. Any number of shots caromed off the rim of the goal and failed to register for Rose.

The game was fast from start to finish and neither team scored for several minutes. Finally Lillicrap and Korn of the Y. M. C. A. each registered, and Kingery followed immediately with two sensational "swishers" from the middle of the floor. The "Y" forwards were hard to handle, and in spite of the fast work of Kingery and Trimble they scored constantly.

The Engineers worked the ball over the floor with nice team work and literally bombarded the goal, but nevertheless only nine field goals were registered for Rose throughout the game. The "Y" led at end of first half 20-10.

Acting Capt. Bobbie Larr, though feeling the effect of an attack of grippe, played a nice game but did not have his usual eye for the basket. Reinhard and Floyd performed well; both were responsible for several field goals and Reinhardt did good work in jumping for Floyd at center. Kingery and Trimble covered well and every goal scored by the "Y" athletes was earned before it was made. Line-up and summary:

Rose 18.		Evansville Y. M. C. A. 39.
Reinhardt	R. F.	Korn
Larr, Orr	L. F.	Lillicrap, E. Budkee
Floyd	C.	Hildt, Lillecrap
Kingery, Henry	R. G.	A. Budkee
Trimble	L. G.	J. McGrew, A. Herman

Field Goals: Reinhardt (2), Larr (1), Floyd (3), Kingery (2), Henry (1), Korn (4), Lillecrap (6), Hildt (2), A. Budkee (3), McGrew (1), E. Budkee (1). Free Throws: Rose 0; Y. M. C. A., 5.

ROSE VS. VINCENNES Y. M. C. A.

ALTHOUGH the Engineers' defense improved in this game, they were again forced to taste defeat, at the hands of a quintet which had beaten the Evansville Y. M. C. A.

As at Evansville the Engineers showed speed and endurance combined with fast passing and team work, but could not connect with the basket. Reinhard was responsible for half of the Rose points with three field goals and one foul goal. Capt. Kenzler of the Vincennes Y. made 11 points for his team and Brunner ran a close second with five field goals. Kingery played a strenuous game at his position.

The Engineers have no cause to regret the two defeats of this trip. The teams met were fully as fast as any to be met in strictly college circles and were playing at home. The Engineers really put up a faster and better floor game than they have shown at any time during the season and although their goal shooting was both unlucky and inaccurate, they showed improvement in other respects.

Lineup and summary:

Rose 14.		Vincennes Y. M. C. A. 27.
Larr, Orr	R. F.	Brunner
Reinhardt	L. F.	Graham
Floyd	C.	Kenzler
Kingery	R. G.	Meise
Trimble, Buck	L. G.	Phillippe

Field Goals: Rhinehardt (3), Floyd (2), Kingery (1), Brunner (5), Graham (2), Kenzler (5) and Meise (1). Foul Goals: Larr (1), Reinhardt (1), Kenzler (1).

FRANKLIN VS. ROSE.

ROSE was not strong enough to handle the Quaker squad on their own floor. The Engineers worked hard throughout the contest but were unable to score. Rose played without the services of Trimble and Reinhard who missed the train. However, other teams such as DePauw and Butler have met worse defeat on the Franklin floor this season.

Exams and consequent lack of practice showed their effect. The men played the floor and secured shots but not until a rally in the second half did Rose obtain a field goal. The score at end of first half stood 19-5. The five points were via the foul goal route by Larr.

Rose came back strong at the opening of the second period and inaugurated a rally which looked serious to the Franklin rooters for a while, but the Engineers slowed up and Franklin maintained a safe lead throughout this period. Kingery, Buck and Floyd played well for Rose, while Bowen and Mullikin were the big point-getters for Franklin. Final score was 46-22.

Rose 22.		Franklin 46.
Larr	F.	Vandivere
Floyd	F.	Mullikin, Hamilton
Davis	C.	Bowen
Buck	G.	Yoeman
Kingery, Orr	G.	Kliver, Nelp

Field Goals: Orr (2), Davis (1), Larr (1), Floyd (3), Yeoman (1), Kliver (3), Nelp (2), Bowen (6), Mullikin (6), Hamilton (2). Foul Goals: Larr (8), Vandivere (6).

THE TOURNAMENT.

IN the Wabash Valley High School Tournament held under the auspices of Rose, Saturday, Feb. 5th, a new and interesting event, and one a little out of the regular athletic channels at Rose, was accomplished. The tournament paid for it itself and undoubtedly the name and fame of Rose has been impressed more than ever before upon the high school students of the Wabash Valley, with resultant good, as we hope, to them and to us. The tournament was organized by Athletic Director Mefford.

Five teams were entered: Clinton, Vincennes, Rockville, Paris and Normal High of Terre Haute. These teams represent the best exponents of high school basket ball in this section of Indiana and Illinois; the teams were pretty evenly matched and consequently the games of the tournament were fast, hard fought, and skillfully contested from start to finish. The quintet from Rockville showed superiority and won a hard earned victory, also a silver loving cup engraved with their names and presented to the winners by Prof. Hathaway at the close of the tournament. Ranking of team—? Individual medals were also awarded to the winners and to individuals making the best showing in the games. It is to be hoped that the Rose management will see fit to repeat the event next year and make the Rose Wabash Valley Tournament an annual event.

Scores of tournament:

Paris, 23; Vincennes, 18.
Rockville, 17; Clinton, 16.
Rockville, 16; Normal High, 14.
Normal, 11; Vincennes, 23.
Rockville, 24; Paris, 17.

ROSE-BUTLER.

THE Rose-Butler game was played after the final of the high school tournament. Butler opened with a dash and scored several field goals before Rose got started. The visitors played the floor fast and hard and couldn't have missed the goal if they had tried. They secured a safe lead in the first half; their fast play and long shots made the Engineers look poor in comparison.

The Engineers fought hard in the second half and made a better showing. Gilbert sent in several substitutes hoping to find a man who could hit the basket. The second team held Butler in this period, the final score being 31-21, Butler. Moore at forward for Butler played an excellent game; Floyd and Larr made the most points for Rose. Butler played better ball and deserved to win.

Butler 31.		Rose 21.
Barr	F	Larr
Moore	F	Floyd
Cornelius	C	Reinhardt
Frankfort	G	Kingery
Sussman	G	Trimble

Field Goals: Barr (4), Moore (7), Frankfort (2), Sussman (2), Larr (3), Floyd (4), Kingery, Davis. Foul Goals: Moore, Larr (2), Floyd. Substitutes—Rose: Davis for Kingery, Howard for Trimble, Brown for Howard, Buck for Reinhardt, Allen for Larr, Orr for Allen. Referee—Robinson, Indiana. Timekeeper—Hathaway, Rose. Time of halves—20 minutes.

ROSE VS. U. OF LOUISVILLE.

THE Rose quintet went to Louisville with the expectation of repeating the defeat administered to the southern team when here. However our opponents showed improvement in form and handed another defeat to the Rose quintet. U. of L. started slow and things looked easy for Rose. After about five minutes of play, however, the U. of L. team seemed to find itself and Daniels and Hornfeld caged field goals in rapid succession. First half ended with Louisville on the long end of a 17-13 score.

The second half was close until the last five minutes when U. of L. went wild and registered as many field goals. Streeter, Allen and Orr got into the game for Rose in the second half, each one scoring a field goal. Kornfeld and Daniels were the stars for Louisville.

Rose 26.		U. of L. 37.
Brown	F	Kornfeld
Reinhard, Streeter	F	Struve, Recktenwald
Floyd, Allen	C	Daniels
Buck	G	McCaleb
Trimble, Orr	G	Terry

Field Goals: Brown (2), Reinhard (2), Floyd (2), Allen (1), Buck (2), Orr (1), Streeter (1), Kornfeld (8), Struve (1), Recktenwald (1), Daniels (6), McCaleb (2). Foul Goals: Reinhard (3), Floyd (1), McCaleb (1).

The articles on engineering in "The Technic," Rose Polytechnic Institute, are well worth reading. An attractive joke department helps to place "The Technic" in the preferred class. —*The Yellow Jacket.*

Engineering as a Career, A Series of Papers by Eminent Engineers. Edited by F. H. Newell, Professor of Civil Engineering, University of Illinois, and C. E. Drayer, Secretary, Cleveland Engineering Society 5x7 cloth 226 pp. Net $1.00.

This book presents for the guidance of youth and their advisers some of the facts usually hard to obtain concerning engineering as a life work. Over a score of engineers and experts prominent in the United States have written separate articles telling what they believe are the personal and educational qualifications required for success and what opportunities await the young man who chooses engineering as a career.

The inspiration for the book came in response to numerous inquiries from high school teachers and others who are frequently called upon to advise young men in their choice and preparation for a professional life. It was found from experience that many youths who planned to study engineering had only the most hazy ideas of what is involved, nor were their teachers and parents much better informed.

In the work of producing the book each contributor and editor gave freely of his time and effort with no thought of compensation other than comes from a realization of service.

A feeling of personal contact with the writers grows out of the fact that each author has unconsciously written into his story something of his own characteristics and aspirations, and has pointed out a few of the courses which to him have seemed to lead to success. The book should prove of special value to professional advisers in vocational guidance work and to parents who have the opportunity of continued observation and intimate acquaintance from which may be learned the aptitudes of their sons.

News of Other Colleges

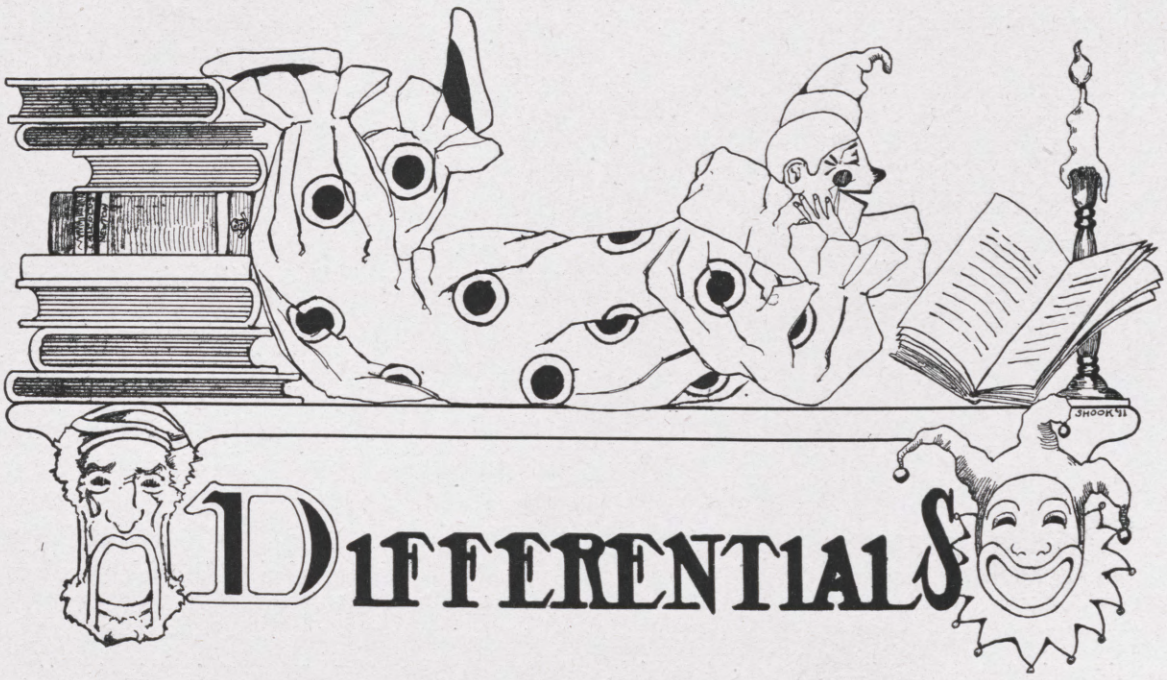
In 1914 there were 216,493 students enrolled in American colleges, universities and technical schools; in 1913 the enrollment was 202,231. College enrollment has more than tripled since 1890.

Chinese students at M. I. T. recently gave a "Chinese Night" at the M. I. T. Union. Interesting numbers were the "stunt" speeches and the shuttlecock games.

The Blanket Tax committee at M. I. T. has thus far collected $1,500 from 575 men.

Notre Dame College has a splendid record for undergraduates who participate in athletics. Assistant Coach Rockne says that almost every one of the 1,200 students engaged in one or more sports during the last year. The record shows that there were 2,014 entries for the various sports in 1915. No wonder they're good.

Worcester Tech Students' Council has selected a publicity committee of three to promote systematic publicity work for athletic contests and school affairs.



INTERVIEWS WITH CELERBITIES.

I. ADAM.

We found Adam raising Cain as usual. He consented, however, to submit to an interview.

"How is Eve?" we began.

"She's out feeding the chickens," replied Adams, "would you like to see her?"

We replied that we certainly would like to see her, but since we were married, the wife might hear of it, and there'd be h—l to pay.

"Speaking of Hell," said Adam, "recalls the days I spent in Eden," and a sigh escaped him. "Those were happy days, but still I have no feeling of bitterness toward Eve. We lived there during the summer, and the fishing was fine, but the place had no modern conveniences; not a heating plant nor a movie show in miles. So we would probably have moved anyway, if we hadn't been evicted."

"Then your maried life has been happy?" we queried.

"Yes," said Adam, "but I've been luckier than other people. You must remember that I never had a mother-in-law."

He—"Time must hang heavy on your hands."

She—"What makes you say that dear?"

He—"I see you're wearing a wrist watch."

The Freshman green
With eyes agleam,
Threw down his hand with glee.
But he blushed as he watched his chips escape
For he thought two pair beat three.

I watched a funeral one day,
A wag stood next to me,
"I've always noticed funerals
Are dead affairs," said he.

He—"Do you believe in preparedness?"

She—"Well, I wouldn't mind being in arms."

—*Jester.*

Instructor—"Your sketch of the room lacks atmosphere."

Art Student—"I was thinking of putting in a ventilator."—*Siren.*

First Chemist—"Have you heard the news. Coles was asphyxiated in his office this morning."

Second Ditto—"What's the matter? Was he talking to himself?"

Soph—"Where are you from?"
Fresh—"I'm from Providence."
Soph—"Oh, are you?"
Fresh—"No, R. I."

"Have a heart, will you?" whined the fellow.

"Sorry, but I haven't," said the girl—and they lost the trick.

Student (writing home)—"How do you spell 'financially.'?"

Other—"F-i-n-a-n-c-i-a-l-l-y, and there are two R's in 'embarrassed' "—*Harper Magazine.*

He—"Can't you find anything pleasant to say about the members of my family?"

She—"Well, I remember they were all opposed to our marriage."

"Were you beating your wife sir?" the judge demanded.

"Yes, yer honor."

"How did you come to do it?"

"Lord knows, jedge. Fer twenty years she alluz wuz th' one what did th' beatin', but I jes' happened ter catch her when she wasn't feelin' right."—*Case and Comment.*

"Is he a stude?"

"No."

"Why are you so sure?"

"Oh, I was in his room. There is no September Morn picture there. No copy of Snappy Stories. He has no House Rules hanging on the wall. There were several copies of The Literary Digest, and no ash trays. What more do you want?"—*Penn State Froth.*

Sardines preserved in oil and rubber cement have been added to products of which the exportation from Norway is prohibited.—*From the Daily Consular and Trade Reports.*

Oh, well; sardines preserved in rubber cement never was our favorite dish.

Chemist—"Gosh, but I've got the insomnia. Can't even sleep in Journal Review."

Teacher—"Johnny, if four men are working eleven hours a day—"

Johnny—"Hold on, ma'am. Nix on them non-union problems please."—*Puck.*

Once I saw
Tombed in a shard of liquid, golden amber,
A cruel spider and a silly fly
And a wise ant, quite close together.
—*Allan Updegraff, in Lippincotts.*

Once I saw
Perched on my bed a flock of pink and green
snakes,
A blue monkey and a red giraffe,
And a purple dog, all in a bunch.
—*Cincinnati Enquirer.*

Once I saw
Approaching toward my flier on the highway,
A heavy truck and a speeding bike
And an ice cart, too close to dodge.
—*Boston Journal.*

Once I saw
As I held three deuces at a small green table,
A king full, and a flush,
And a straight, and they told me to stay out
'till
I had something.
—*Detroit Free Press.*

Once I saw
Calmly drinking at a bar together,
A Britain, a German, a Frenchman,
And a Herzegovinian from Serajevo.
I called the police.
—*St. Louis Post Dispatch.*

THE RAREBIT SECTION.

(If you must partake, do so sparingly.)

Do you give your dog much exercise.
Yes, he goes for a tramp every day.

Is the cashier in.
No.
Gone out for a rest?
No. Gone out to escape arrest.

Wischmeyer, calling the roll in Gas Engines —"Weinhardt!"
Weinhardt—"Hello!"

"I would not wear so short a skirt,"
Said Myrtle Goldilocks;
Then she tripped down the avenue,
A-wearing rolled down socks.
—*Houston Post.*

"I wouldn't wear them rolled-down socks,"
Said Kathryn Keller-Koch,
Then stopped and hoisted up her foot
To wind her ankle watch.
—*Silver and Gold.*

"I'll never wear an ankle watch,"
Said dainty Lizzie Lutz.
And then she took six bones and bought,
A pair of fur-top boots. —*Kernal.*

Goldstine—"Gee, I wish I could skate as good on both feet as Jo Jo can on one."

First Father—"Would you take your daughter to see a show like that?"
Second Father—"No, the chances are nine to ten she's already seen it."

Pat, ye should always learn to thrim yer finger nails with your left hand fer some day ye might lose your right.

Shop slogan for 1916—"Too much work."

Ray—"I want to tell you a good joke about mistletoe."
Fairy—"Sure it's not over my head?"

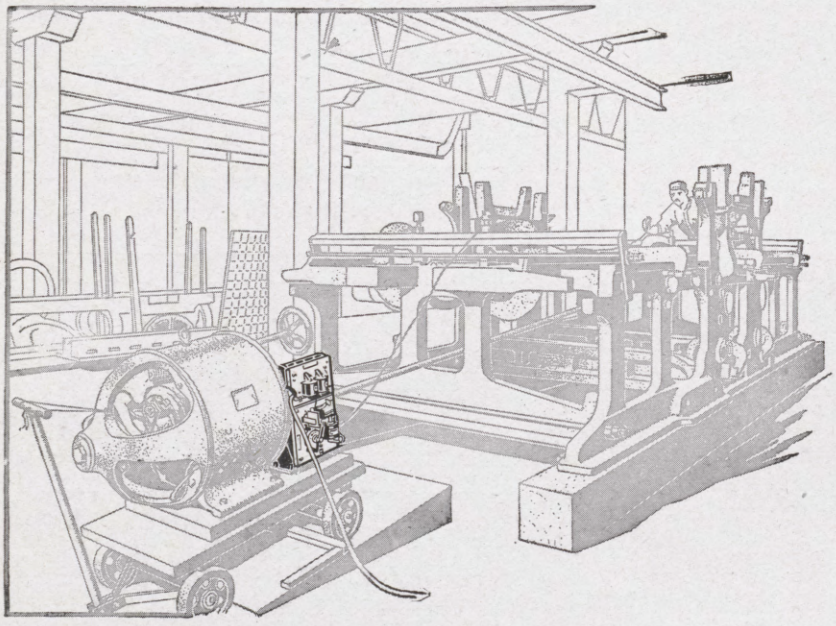
"You have made a great impression upon me, dear."
"I'm so sorry. I'll not hold you so tight next time."

She—"Here's a Hippodrome special. I wonder what that is?"
He—"Twenty cents, can't you see?"

Observer—"Your husband dresses so quiet and nice."
Wife: "Huh, you should hear him when he loses a collar button."

"You can be a college man and still be a gentleman."—(I. S. N. Handbook.)

E.C.&M. Automatic Motor Starters



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The only effort necessary to start or stop the motor is to push a button or open or close a knife switch.

The Starter automatically protects the motor and driven machine.

This Starter saves current and increases production.

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2. No time is lost in starting, because the motor accelerates in the *shortest safe time.*

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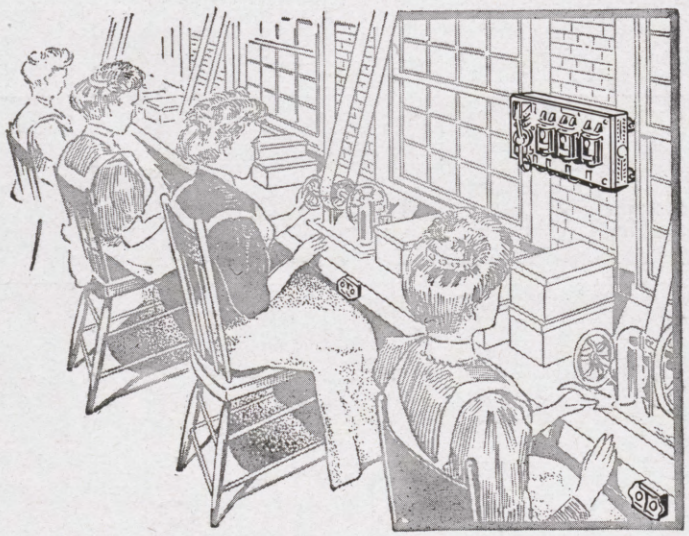
Write for Bulletin 1016



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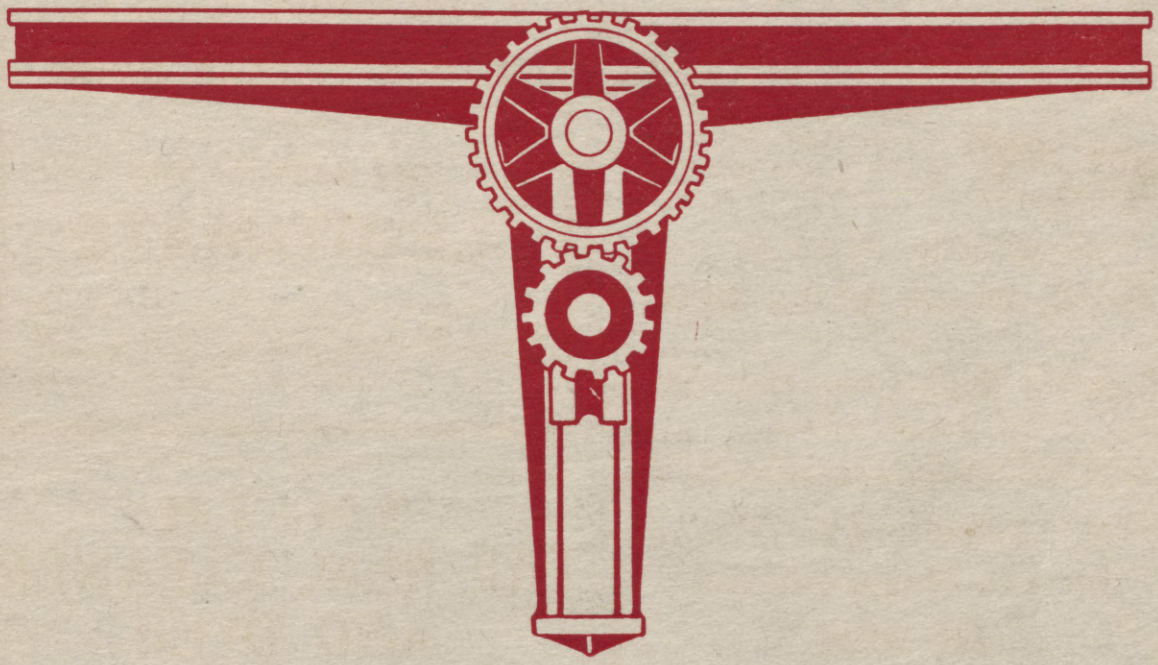

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